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DRAWINGS ATTACHED

1 302 540

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(72) Inventor WILLIAM BERNARD BROWN

(54) LAMINATED INSULATION BOARD

(71) We, MONSANTO CHEMICALS LIMITED, a British Company, of Monsanto House, 10—18 Victoria Street, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to insulation materials and in particular to a laminated insulation board for use as a lining for walls and partitions or as a ceiling board.

It is known to use insulation boards in the construction of building structures, but these have often been found to be unsatisfactory in that those that are porous permit the ingress of moisture, giving rise to condensation problems, whereas those that are not porous often have insufficient heat insulation properties.

A novel laminated insulation board has now been discovered.

The laminated insulation board of the invention is one that is suitable for application to walls or ceilings and comprises a layer of foamed thermoplastic synthetic resin, a facing layer of boarding material and a polyolefin or polyvinyl halide sheet which extends beyond the other components of the laminate forming a lap along at least one edge of the board.

The invention also includes a method of insulating a building in which there is used an insulation board according to the invention with the polyolefin or polyvinyl halide sheet positioned next to the sheet of foamed resin on the side of the sheet that is warmer under conditions of use and also a building that has been insulated in this way.

The insulation board is applied to a wall, partition or ceiling with the boarding material surface visible so that for example when designing a board for insulating a warm room against loss of heat to its surroundings the polyolefin or polyvinyl halide sheet should be interposed between the boarding material and the foamed resin: this is in fact the preferred construction. On the other hand, an insulation board intended for insulating a cold store would have the foamed resin interposed between the boarding material and the polyolefin or polyvinyl halide sheet.

The polyvinyl halide is preferably polyvinyl chloride and the polyolefin is frequently a polymer of an aliphatic olefin. Preferably the olefin contains not more than four carbon atoms, ethylene and propylene, particularly ethylene, being the especially preferred olefins. Polymerisation of the polyolefin is preferably effected by a "high-pressure" process, that is to say under conditions of elevated pressure under the influence of a free-radical-producing catalyst; alternatively a "low-pressure" process employing for example a Ziegler catalyst can be used.

The polyolefin or polyvinyl halide sheet is preferably in the thickness range 0.0005 to 0.010 inch and has a low water vapour permeability. Excellent results have been obtained with polyolefin or polyvinyl halide sheet of thickness within the range 0.001 to 0.005 inch. Sheets of this thickness are often referred to as "film". An advantage of the insulation board of the invention is that the water vapour transmission rate of the insulation board can be varied according to its intended use. Thus in general the thicker the polyolefin or polyvinyl halide sheet is the greater its resistance to the transmission of water vapour.

It is particularly preferred to use a polyolefin or polyvinyl halide sheet that has been mounted on a suitable carrier, for example

a non-inflammable treated Kraft paper. Such Kraft papers can be treated with bitumen, and are obtainable in a wide range of tensile strengths from approximately 20 to 60 pounds per inch. The polyolefin or polyvinyl halide sheet can be mounted on one sheet of the carrier or it can be contained between two sheets.

The foamed thermoplastic synthetic resin is preferably a polymer or copolymer of a vinyl or vinylidene monomer, preferably a hydrocarbon monomer such as for example ethylene, propylene, butadiene, styrene, vinyltoluene or α-methylstyrene, or a substituted monomer such as for example acrylonitrile, vinyl chloride, vinyl acetate, methyl acrylate, methyl methacrylate or ethyl acrylate. Excellent results have been obtained using polystyrene and this is in fact the preferred resin, particularly when it is a flame-retardant grade.

The thickness of the foamed synthetic resin layer is often from 0.1 to 1 inch and is preferably from 0.3 to 0.8 inch such as for example 0.5 inch.

The boarding material can be any one of those customarily used in the building industry, such as for example, plasterboard, hardboard of wood-chip board. The most preferred material is plasterboard which is normally composed of a core of set gypsum or anhydride plaster enclosed between and bonded to two sheets of heavy paper. The core can be solid or cellular gypsum and can contain a small proportion of fibre if desired. Examples of suitable plasterboards are described in British Standard No. 1230:1945.

The boarding material is preferably from about 0.1 to 2 inches thick, and especially between 0.25 and 1 inch thick, for example 0.375 or 0.5 inch thick.

The components of the laminate can be bonded together by any convenient means, such as by the application of an adhesive. Where an adhesive is used it is preferably applied in the form of discreet bands, especially longitudinal discreet bands. Any suitable conventional adhesive may be used which does not attack the foam, for example synthetic latex, waterglass, or bitument adhesives. A particularly suitable adhesive is polyvinyl acetate.

The insulating board of the invention can be of any convenient length and width, but is most advantageously between about 1 and about 5 feet wide, for example 3 or 4 feet wide, and between about 4 and 10 feet long, for example about 6 or about 8 feet long.

The insulation boards of the invention can be used to form a board system with a water vapour resistant joint between two adjacent insulation boards by overlapping the joint with the lap of the polyolefin or polyvinyl halide sheet. Board systems comprising more than two insulation boards can also be built up in this way.

Thus there is included in the present invention a board system consisting of two or more of the insulation boards described above, in which each joint between adjacent insulation boards is made water vapour resistant by overlapping the joint with a lap of the polyolefin or polyvinyl halide sheet from one insulation board and attaching it to the other. A joint with a double overlap can also be made. In this case a lap from each of the adjacent insulation boards is fixed on to the other. This is in fact the preferred way of constructing the board systems of the invention and one particular method of doing this is illustrated in the Drawings accompanying the Provisional Specification, in which:

Figure 1 shows a section of part of an insulation board having a layer of polyolefin or polyvinyl halide sheet, w, with a free lap, x. The layer of board material and the sheet of foamed thermoplastic synthetic resin are denoted by y and z respectively;

Figure 2 shows a section of part of a second insulation board in which the layer of polyolefin or polyvinyl halide sheet, w^1, bears a lap, x^1, which is wrapped around and adhesively attached to the end of the layer of foamed thermoplastic synthetic resin, z^1; and

Figure 3 shows a section of a joint made between the insulation boards illustrated in Figures 1 and 2, and shows the way in which a water vapour resistant seal is formed by wrapping and adhesively attaching the free lap of one insulation board around the second insulation board.

The insulation boards and board systems can be used as an insulating lining for walls and partitions or as a ceiling board in new buildings. They can also be fixed to existing walls to form a new surface for redecorating. The sheet is light enough to be fixed to vertical walls by adhesive alone, although nails or screws can be used if desired.

The invention is illustrated by the following Examples.

EXAMPLE 1

This Example describes the production of an insulation board according to the invention from foamed polystyrene board, gypsum wallboard and a polyethylene sheet contained between two layers of Kraft paper.

A sheet of polyethylene of thickness 0.001 inch was mounted between two layers of Kraft paper to provide a laminate of polyethylene sheet. Both sides of the laminate were coated with polyvinyl acetate adhesive and interposed between a layer of gypsum wallboard of thickness $\frac{3}{8}$ inch and a foamed polystyrene board $\frac{1}{2}$ inch thick.

The resultant assembly was heated to

70°C. in a press at a pressure of about 10 pounds per square inch. There was produced a laminated insulation board that was found to have excellent heat insulating properties and an excellent resistance to water vapour. The water vapour transmission rate was about 25 grams per square metre per 24 hours.

EXAMPLE 2

This Example describes the production of an insulation board according to the invention from foamed polystyrene board, gypsum wallboard and a polyethylene sheet contained between two layers of Kraft paper.

A sheet of polyethylene of thickness 0.003 inch was mounted between two layers of Kraft paper to provide a laminate of polyethylene sheet. Both sides of the laminate were coated with polyvinyl acetate adhesive and interposed between a gypsum wallboard of thickness $\frac{3}{8}$ inch and a foamed polystyrene board $\frac{1}{2}$ inch thick.

The resultant assembly was heated to 70°C. in a press at a pressure of about 10 pounds per square inch. There was produced a laminated insulation board that was found to have excellent heat insulating properties and an excellent resistance to water vapour. The water vapour transmission rate was about 5 grams per square metre per 24 hours.

WHAT WE CLAIM IS:—

1. A laminated insulation board for application to walls or ceilings comprising a layer of foamed thermoplastic synthetic resin, a facing layer of boarding material and a polyolefin or polyvinyl halide sheet which extends beyond the other components of the laminate forming a lap along at least one edge of the board.

2. An insulation board according to Claim 1, in which the polyolefin or polyvinyl halide sheet is interposed between the boarding material and the foamed resin.

3. An insulation board according to any of the preceding claims, in which the layer of polyolefin sheet comprises polyethylene.

4. An insulation board according to either of Claims 1 and 2 in which the layer of polyvinyl halide sheet comprises polyvinyl chloride.

5. An insulation board according to any of the preceding claims, in which the sheet of foamed resin comprises polystyrene.

6. An insulation board according to any of the preceding claims, in which the facing layer of boarding material is plasterboard.

7. An insulation board according to any of the preceding claims, in which the thickness of the polyolefin or polyvinyl halide sheet is from 0.001 to 0.005 inch.

8. An insulation board according to any of the preceding claims, in which the thickness of the sheet of foamed resin is from 0.3 to 0.8 inch.

9. An insulation board according to any of the preceding claims, in which the thickness of the layer of boarding material is from 0.25 to 1 inch.

10. An insulation board according to any of the preceding claims, in which the polyolefin or polyvinyl halide sheet is mounted on a suitable carrier.

11. An insulation board according to Claim 1 substantially as described with reference to the Drawings accompanying the Provisional Specification.

12. An insulation board according to Claim 1 substantially as described in either of Examples 1 and 2.

13. A board system consisting of two or more insulation boards according to Claim 1 in which each joint between adjacent insulation boards is made water vapour resistant by overlapping the joint with a lap of the polyolefin or polyvinyl halide sheet from one insulation board and attaching it to the other.

14. A board system according to Claim 13, in which a lap from each of the adjacent insulation boards is fixed on to the other.

15. A board system according to Claim 13, substantially as described with reference to the Drawings accompanying the Provisional Specification.

16. A method of insulating a building in which there is used an insulation board according to Claim 1 and in which the polyolefin or polyvinyl halide sheet is positioned next to the sheet of foamed resin on the side of the sheet that is warmer under conditions of use.

17. A method of insulating a building according to Claim 16 in which there is used an insulation board according to any of Claims 2 to 12.

18. A method of insulating a building, in which there is used a board system according to any of Claims 13 to 15.

19. A building that has been insulated with an insulation board according to any of Claims 1 to 12.

20. A building that has been insulated with a board system according to any of Claims 13 to 15.

C. G. WICKHAM,
Chartered Patent Agent,
Monsanto House,
10—18 Victoria Street,
London, S.W.1.

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1302540 PROVISIONAL SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1

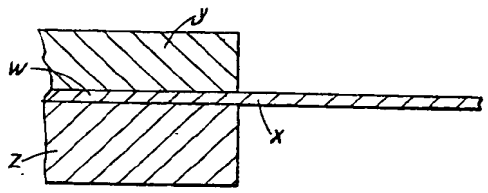

Fig.2

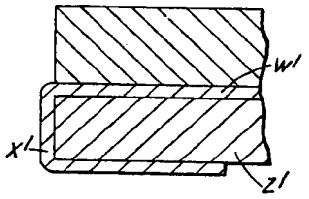

Fig.3